

The average annual salary for operations research analysts in the Federal Government in nonsupervisory, supervisory, and managerial positions was \$72,000 in early 1999.

Related Occupations

Operations research analysts apply mathematical principles to large, complicated problems. Workers in other occupations that stress quantitative analysis include computer scientists, systems analysts, modeling specialists, logistics consultants, engineers, mathematicians, statisticians, and economists. Because its goal is improved organizational effectiveness, operations research also is closely allied to managerial occupations.

Sources of Additional Information

Information on career opportunities for operations research analysts is available from:

☛ The Institute for Operations Research and the Management Sciences, 901 Elkridge Landing Rd., Suite 400, Linthicum, MD 21090. Internet: <http://www.informs.org>

For information on OR careers in the Armed Forces and Department of Defense, contact:

☛ Military Operations Research Society, 101 South Whiting St., Suite 202, Alexandria, VA 22304. Internet: <http://www.mors.org>

Statisticians

(O*NET 25312)

Significant Points

- Many individuals with degrees in statistics enter jobs that do not have the title statistician.
- Job prospects as a statistician in private industry and academia will be best for those with a graduate degree and some work experience in statistics.

Nature of the Work

Statistics is the scientific application of mathematical principles to the collection, analysis and presentation of numerical data. Statisticians contribute to scientific inquiry by applying their mathematical knowledge to the design of surveys and experiments; collection, processing, and analysis of data; and interpretation of the results. Statisticians often apply their knowledge of statistical methods to a variety of subject areas, such as biology, economics, engineering, medicine, public health, psychology, marketing, and education. Many applications cannot occur without use of statistical techniques, such as designing experiments to gain Federal approval of a newly manufactured drug.

One especially useful technique used by statisticians is sampling—obtaining information about a population of people or group of things by surveying a small portion of the total. For example, to determine the size of the audience for particular programs, television-rating services survey only a few thousand families, rather than all viewers. Statisticians decide where and how to gather the data, determine the type and size of the sample group, and develop the survey questionnaire or reporting form. They also prepare instructions for workers who will collect and tabulate the data. Finally, statisticians analyze, interpret, and summarize the data using computer software.

In manufacturing industries, statisticians play an important role in quality control and product improvement. In an automobile company, for example, statisticians might design experiments to determine the failure time of engines exposed to extreme weather conditions by running individual engines until failure and breakdown. Such destructive tests are conducted on a representative sample of



Statisticians need good communication skills to convey complex ideas to a nontechnical audience.

the engines, and the results enable the company to identify changes that can improve engine performance.

Because statistical specialists are used in so many work areas, specialists who use statistics often have different professional designations. For example, a person using statistical methods on economic data may have the title econometrician, while statisticians in public health and medicine may hold titles of biostatistician, biometrician, or epidemiologist. (See the statement on economists and marketing research analysts elsewhere in the *Handbook*).

Working Conditions

Statisticians usually work regular hours in comfortable offices. Some statisticians travel to provide advice on research projects, supervise and set up surveys, or gather statistical data. Some may have duties that vary widely, such as designing experiments or performing fieldwork in various communities. Statisticians who work in academia generally have a mix of teaching and research responsibilities.

Employment

Persons holding the title of statistician held about 17,000 jobs in 1998. Over one-fourth of these jobs were in the Federal Government, where statisticians were concentrated in the Departments of Commerce, Agriculture, and Health and Human Services. Most of the remaining jobs were in private industry, especially in the biopharmaceutical industry. In addition, many professionals with a background in statistics were among the 20,000 mathematics faculty in colleges and universities in 1998, according to the American Mathematical Society. (See the statement on college and university faculty elsewhere in the *Handbook*.)

Training, Other Qualifications, and Advancement

Although more employment opportunities are becoming available to well qualified statisticians with bachelor's degrees, a master's degree in statistics or mathematics is the minimum educational requirement for most jobs with job title statistician. Research positions in institutions of higher education, for example, require a graduate degree, usually a doctorate, in statistics. Beginning positions in industrial research often require a master's degree combined with several years of experience.

The training required for employment as an entry level statistician in the Federal Government, however, is a bachelor's degree, including at least 15 semester hours of statistics or a combination of 15 hours of mathematics and statistics, if at least 6 semester hours are in statistics. Qualifying as a mathematical statistician in the Federal Government requires 24 semester hours of mathematics and statistics with a minimum of 6 semester hours in statistics

and 12 semester hours in an area of advanced mathematics, such as calculus, differential equations, or vector analysis.

About 80 colleges and universities offered bachelor's degrees in statistics in 1998. Many other schools also offered degrees in mathematics, operations research, and other fields, which included a sufficient number of courses in statistics to qualify graduates for some beginning positions in the Federal Government. Required subjects for statistics majors include differential and integral calculus, statistical methods, mathematical modeling, and probability theory. Additional courses that undergraduates should take include linear algebra, design and analysis of experiments, applied multivariate analysis, and mathematical statistics.

In 1998, approximately 110 universities offered a master's degree program in statistics, and about 60 offered a doctoral degree program. Many other schools also offered graduate-level courses in applied statistics for students majoring in biology, business, economics, education, engineering, psychology, and other fields. Acceptance into graduate statistics programs does not require an undergraduate degree in statistics, although good training in mathematics is essential.

Because computers are used extensively for statistical applications, a strong background in computer science is highly recommended. For positions involving quality and productivity improvement, training in engineering or physical science is useful. A background in biological, chemical, or health science is important for positions involving the preparation and testing of pharmaceutical or agricultural products. Courses in economics and business administration are helpful for many jobs in market research, business analysis, and forecasting.

Good communications skills are important for prospective statisticians, in order to qualify for many positions in industry, where the need to explain technical matters to laymen is common. A solid understanding of business and the economy is important for those who plan to work in private industry.

Beginning statisticians are assigned work supervised by an experienced statistician. With experience, they may advance to positions with ample technical and supervisory responsibility. However, opportunities for promotion increase with advanced degrees. Master's and Ph.D. degree holders usually enjoy independence in their work and become qualified to engage in research, develop statistical methods, or, after a number of years of experience in a particular area, become statistical consultants.

Job Outlook

Job opportunities should remain favorable for individuals with statistical degrees, although many of these positions will not carry an explicit job title of statistician. Employment of those with the title statistician is expected to grow little through the year 2008. Many individuals will find positions in which they do not have the title statistician. This is especially true for those involved in analyzing and interpreting data from other disciplines such as economics, biological science, psychology, or engineering. In addition to the limited number of jobs resulting from growth, a number of openings will become available as statisticians retire, transfer to other occupations, or leave the work force for other reasons.

Among graduates with a bachelor's degree in statistics, those with a strong background in an allied field, such as finance, engineering, or computer science, should have the best prospects of finding jobs related to their field of study. Federal agencies will hire statisticians in many fields, including demography, agriculture, consumer and producer surveys, Social Security, health care,

and environmental quality. Competition for entry level positions in the Federal Government is expected to be strong for those just meeting the minimum qualification standards for statisticians, since this is one of the few employers that considers a bachelor's degree to be an adequate entry level qualification. Those who meet State certification requirements may become high school statistics teachers. (For additional information, see the statement on kindergarten, elementary, and secondary school teachers elsewhere in the *Handbook*.)

Manufacturing firms will hire statisticians at the master's and doctoral degree levels for quality control of various products, including pharmaceuticals, motor vehicles, chemicals, and food. For example, pharmaceutical firms employ statisticians to assess the safety and effectiveness of new drugs. To address global product competition, motor vehicle manufacturers will need statisticians to improve the quality of automobiles, trucks, and their components by developing and testing new designs. Statisticians with knowledge of engineering and the physical sciences will find jobs in research and development, working with teams of scientists and engineers to help improve design and production processes to ensure consistent quality of newly developed products. Business firms will rely heavily on workers with a background in statistics, to forecast sales, analyze business conditions, and help solve management problems in order to maximize profits. In addition, sophisticated statistical services will increasingly be offered to other businesses by consulting firms.

Earnings

Median annual earnings of statisticians were \$48,540 in 1998. The middle 50 percent earned between \$35,800 and \$71,030. The lowest 10 percent had earnings of less than \$28,240, while the top 10 percent earned over \$87,180. The average annual salary for statisticians in the Federal Government in nonsupervisory, supervisory, and managerial positions was \$62,800 in early 1999, while mathematical statisticians averaged \$69,000. According to a 1999 survey by the National Association of Colleges and Employers, starting salary offers for mathematics/statistics graduates with a bachelor's degree averaged about \$37,300 a year.

Related Occupations

People in numerous occupations work with statistics. Among these are actuaries; mathematicians; operations research analysts; computer systems analysts and programmers; engineers; economists; financial analysts; and information, life, physical, and social scientists.

Sources of Additional Information

For information about career opportunities in statistics, contact:

☛ American Statistical Association, 1429 Duke St., Alexandria, VA 22314. Internet: <http://amstat.org/index.html>

For more information on careers and training in mathematics (a field closely related to statistics), especially for doctoral level employment, contact:

☛ American Mathematical Society, Department of Professional Programs and Services, P.O. Box 6248, Providence, RI 02940-6248. Internet: <http://www.ams.org>

Information on obtaining a job as a statistician with the Federal Government may be obtained from the Office of Personnel Management through a telephone-based system. Consult your telephone directory under U.S. Government for a local number, or call (912) 757-3000; TDD (912) 744-2299. This number is not toll free, and charges may result. Information may also be obtained through the Internet site: [http:// www.usajobs.opm.gov](http://www.usajobs.opm.gov)